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THE CLAVARIA FISTULOSA GROUP

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(WITH PLATES 3–5, CONTAINING 8 FIGURES)

Plants of this group have been reported very rarely from this country. *Clavaria juncea* is listed by Dr. Peck in the 22d Report of the New York State Museum from specimens collected by Dr. Howe, and Peck says this was the first report of the species from America. It has been recently reported from Michigan by Kauffman. Clement's illustration in Minnesota Plant Studies, IV: p. 113, evidently refers to a form of the *Clavaria vermicularis* group.

Dr. Peck found a single specimen of *Clavaria fistulosa* in the Catskill Mountains in October, 1872, and this is the only collection of the species outside of Europe mentioned in the Sylloge. Professor Dearness collected the species in coniferous swamps at Avon, Canada, in October, 1897, and it was distributed in Fungi Columb. *1214* under the name *Clavaria inaequalis*. Professor Dearness has sent me specimens of the collection correctly named.

Clavaria contorta, which is supposed to be a young stage of *Clavaria fistulosa,* is said in the Sylloge to have been collected by some of the older botanists in New England and North Carolina.

The little notice the plants have received is probably due as much to the conditions under which sporophores are produced as to the rarity of the mycelium. It requires at least two weeks of daily rain, with the dead leaves on the ground continuously soaked with water, to produce a crop of *Clavaria juncea* at Neebish, Michigan. Under such conditions, specimens are usually to

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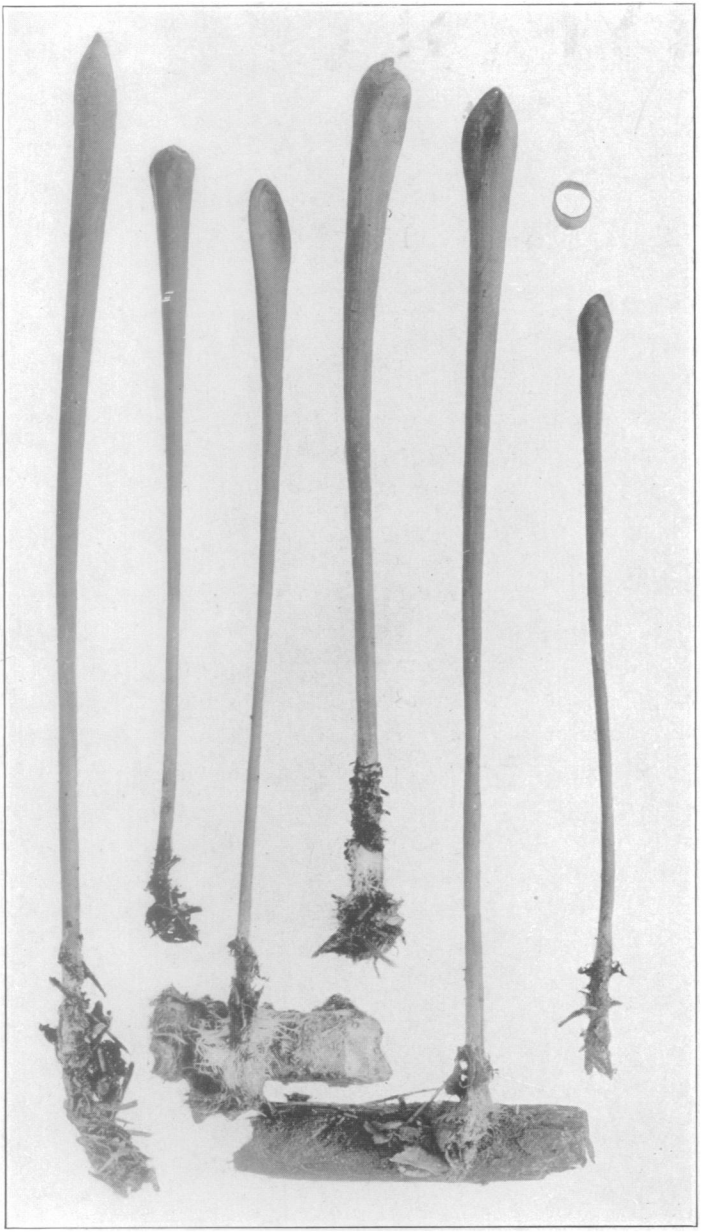


CLAVARIA ARDENIA Sow.

be found on the leaves in the woods and sometimes they are very abundant. *Clavaria fistulosa* is more rare. Only once have I seen it abundant at Neebish. I also found a single specimen near Lake Rosseau, in Ontario.

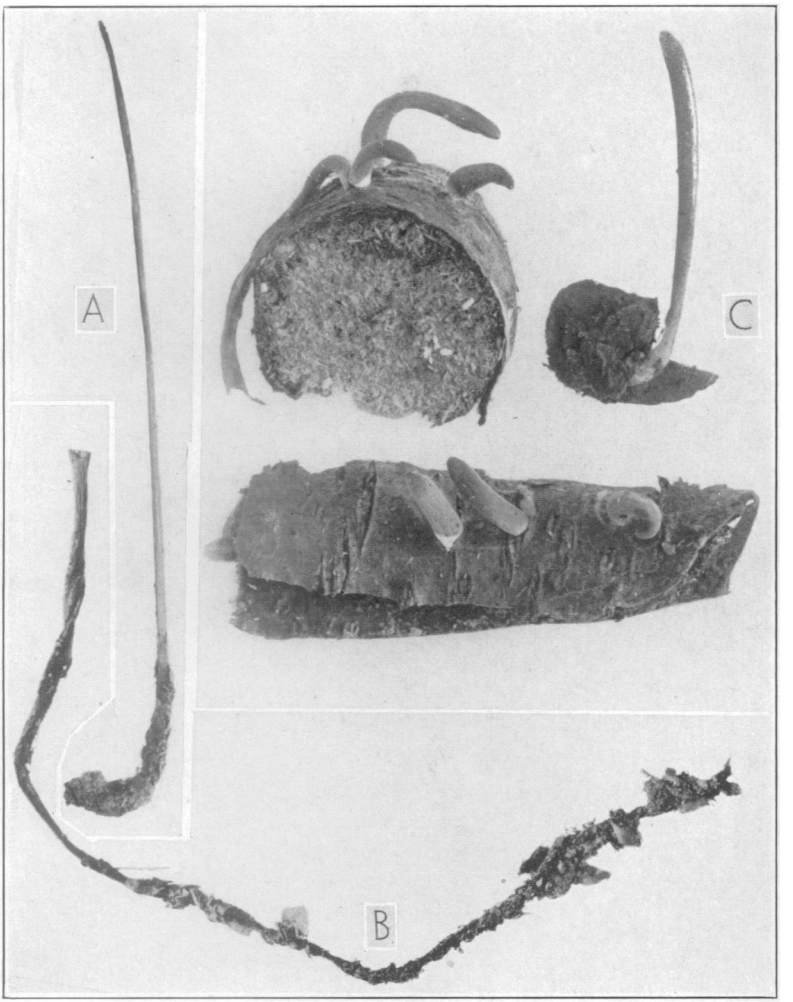
I show in the plates the following forms belonging to the group.

CLAVARIA ARDENIA SOW. Pl. 3

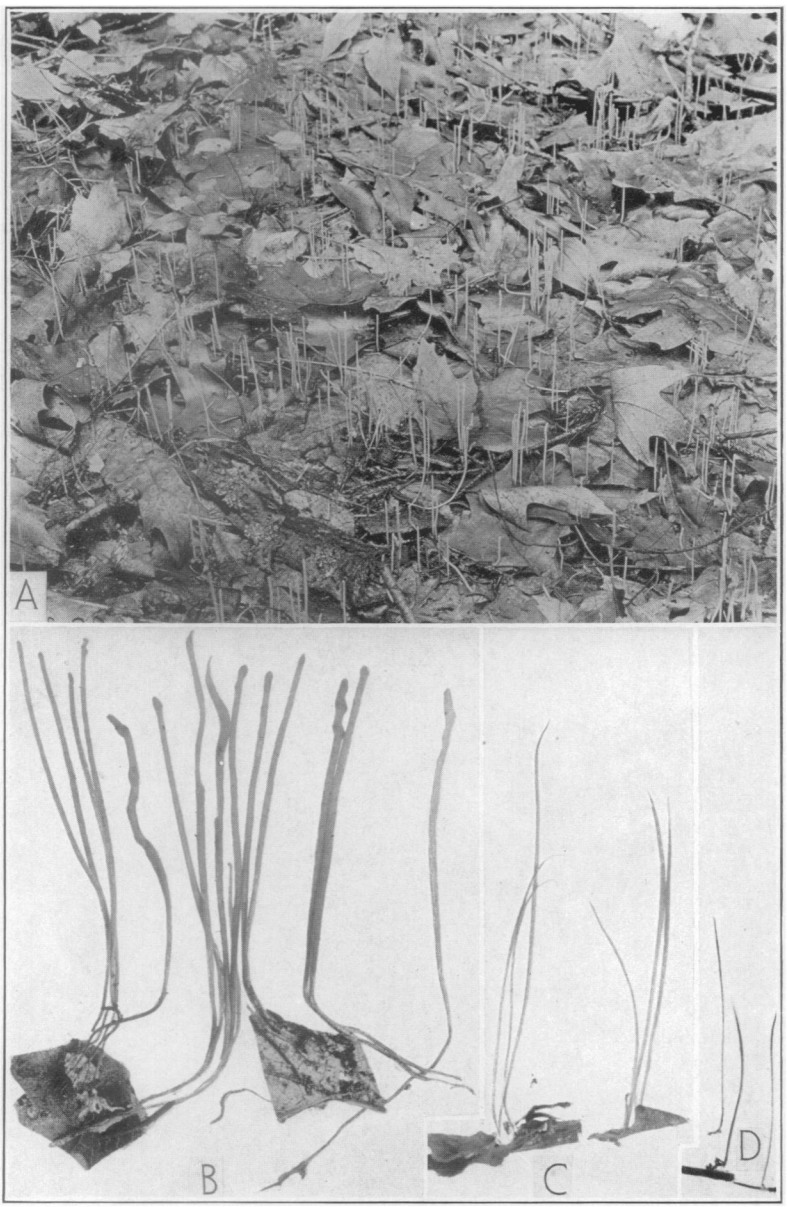
This form is more abundant than *Clavaria fistulosa* at Neebish. The clubs are enlarged and inflated at the apex. They are abruptly pointed when young but become truncate and often perforated when old. The plants are figured by Sowerby in his plate 215. The species is said to grow 8 inches high in the British Isles. Our plants were 4–7 inches high and about one fourth of an inch thick at the apex. Stevenson says it is the only form of *Clavaria fistulosa* found in the British Isles. His description reads: "Ferruginous, then date-brown, simple, very long, more than 20 cm., thickened upward, acute when young, then obtuse or hollowed out at the apex, tomentose at the base, not rooting, on fallen branches." The spores are given in the Sylloge as broad, hyaline, ovoid, apiculate at one end, 15×8–$9\,\mu$. The description fits our plants exactly but the spores were narrower, 12–16×5–$7\,\mu$. The plants grew on the ground in coniferous woods and the clubs were attached to small sticks by copious whitish mycelium as shown in the illustration. The species is usually considered a variety of *Clavaria fistulosa*.

CLAVARIA FISTULOSA Fries. Pl. 4, A

The photograph was taken from the Lake Rosseau specimen. It is not enlarged or inflated at the apex. It is the form illustrated by Britzelmayr. It appears to be typical *Clavaria fistulosa* and is described, as follows: "Simple, slender, very long, strict, fistulose, somewhat obtuse, yellow becoming reddish, root short, villous, spores ellipsoid-oblong, commonly obtuse above and attenuate at the base, hyaline, 14–16×6–$7\,\mu$." It is said to be very closely akin to *Clavaria macrorrhiza* and was considered by Fries to be a large form of *Clavaria juncea*.



A. CLAVARIA FISTULOSA FRIES
B. CLAVARIA MACRORRHIZA SW.
C. CLAVARIA CONTORTA HOLMSK



CLAVARIA JUNCEA FRIES

CLAVARIA MACRORRHIZA Sw. Pl. 4, B

One of the plants sent me by Professor Dearness had a long rooting base. It is shown in the photograph. The top of the club was broken off, but Professor Dearness informs me it was about five inches long when collected. The plant appears to represent *Clavaria macrorrhiza,* which is described as "simple, fistulose, glabrous, subequal or somewhat thickened upward, obtuse, yellowish becoming fuscous, twisted below, rooted with a long whitish-fibrillose root." The root is said to be over three inches long and the club is 2–4 inches high. Swartz's illustration in Vet. Akad. Handl. *pl. 6, f. 1,* shows the long root perpendicular as if it grew straight down into the ground. The whole root is covered with long, white, villous hairs like those on the bases of the plants in our photographs of *Clavaria ardenia,* which seems to show that it grew attached to sticks or logs in leaf-cold. The hairs have collapsed in the dried plant from which the photograph was taken and do not show very plainly in the picture. Von Hoehnel in the Oesterr. Bot. Zeitschrift for December, 1904, argues that *Clavaria macrorrhiza* is a form of *Clavaria fistulosa* with a long root, and compares the roots of *Collybia esculenta* and *Collybia conigena,* which are long or short according to circumstances. He had not, however, found a plant with such a root.

CLAVARIA CONTORTA Holmsk. Pl. 4, C

I collected the specimens from which the photographs were taken on branches of dead alder at Neebish, Michigan, in October, 1911, and identified them as *Clavaria contorta.* The figures are reproduced natural size. The plants were on branches of a fallen tree above ground and I did not connect them with *Clavaria fistulosa,* which I have always found on sticks buried in leaves in coniferous woods. Von Hoehnel in the article mentioned above holds that *Clavaria contorta* is a young stage of *Clavaria fistulosa* and since reading his arguments I am inclined to agree that at least they belong to the same group. The tall, straight plant is very much like *Clavaria fistulosa.* The club is hollow with a very thin wall just like the section of *Clavaria ardenia* shown in the frontispiece. The substance of both is com-

posed of narrow, straight hyphae with large lactiferous tubes, and the spores are the same. In these small plants they average larger than in *Clavaria fistulosa,* 14–18 × 6–9 μ. The color of both species is the same. The young plants are stuffed and directly erumpent from the wood. Von Hoehnel found such forms as these growing with specimens of true *Clavaria fistulosa.* The usual description of *Clavaria contorta* reads: "Plants simple, erumpent, stuffed, spongy-fleshy, soft to the touch, somewhat twisted, rugose, obtuse, pruinose, watery-yellow. On dead branches of alder, hazel, etc. 2.5–3 cm. high, 6–9 mm. thick."

Von Hoehnel thinks that *Clavaria brachiata* Fries is also a form of *Clavaria fistulosa,* with the clubs branching.

CLAVARIA JUNCEA Fries. Pl. 5

The plants grow on dead leaves of frondose trees and the decumbent, creeping base is attached to the leaf by white, villous mycelium. The mycelium appears to live in the mould and grows up over the leaves to form the fruiting clubs. The erect club is about 2 inches high, slender and straight, either obtuse at the apex as in *B* or acute as in *C*. Under favorable weather conditions the plants are very numerous and cover the leaves over wide spaces as shown in *A*. On one occasion there was a thick forest of these slender clubs on both sides of a path in the woods covering the leaves for a distance of twenty-five feet. The description of the species reads: "Gregarious, thin, filiform, flaccid, fistulose, acute, from pallid to rufescent, base creeping, fibrillose." According to Winter, the spores are obovoid, 4 μ in diameter. Schroeter gives the measurements as 8–9 × 4–5 μ. In our plants, the spores are 9–12 × 4–5 μ and shaped like those in the other species in the group.

Clavaria juncea is the most common species in the group and has been illustrated seven times, according to Saccardo in the nineteenth volume of his "Sylloge." It is also reported from Ceylon and Australia.

Var. *vivipara* is a form reported in Europe and figured by Bulliard in his plate 463 and also by Britzelmayr. It has the club as well as the rooting base fibrillose on the sides. In all the Neebish plants the erect portion of the club was smooth.

In localities where the plants were not abundant, smaller forms like those in *D* were found with the others. They were sometimes attached to balsam needles. They appeared to be the same species, however. They resemble species of *Typhula,* but there is no sclerotoid tuber at the base.

Clavaria juncea is quite distinct from other members of the group, but it has the same essential features; hollow, thin-walled clubs composed of straight, parallel hyphae 6–8 μ in diameter, with many cross partitions. The plants are tough and elastic and it is difficult to keep them from curling long enough to make a photograph. They remain fresh but a short time and when dry are not easy to find.

The forms or species in this group are well characterized and quite distinct from other club-fungi. The external resemblance is perhaps nearest to some species of *Typhula* or species of *Clavaria* with caespitose clubs.

The real phylogenetic connection of the members of the group with each other is unknown and the superficial resemblances may be misleading. All the forms should be described, but kept together in a single group.

GENESEO, ILL.

EXPLANATION OF PLATES 3–5

Plate 3. *Clavaria ardenia* Sow.

Plate 4. *A. Clavaria fistulosa* Fries. × $\frac{2}{3}$.
B. Clavaria macrorrhiza Sw.
C. Clavaria contorta Holmsk.

Plate 5. *A, B, C, D, Clavaria juncea* Fries.